IN THE SPECIFICATION:

Please amend paragraph number **[0001]** as follows:

[0001] This is a continuation of U.S. Patent Application Serial No. 10/271,259, filed on October 15, 2002, now U.S. Patent 6,689,685, issued on February 10, 2004, which is a divisional of U.S. Patent Application Serial No. 09/812,099, filed on March 19, 2001, now U.S. Patent No. 6,479,381, which is a continuation of U.S. Patent Application Serial No. 08/862,685, filed on May 23, 1997, now U.S. Patent No. 6,204,171, which is a continuation-in-part of U.S. Patent Application Serial No. 08/653,428, filed on May 24, 1996, now U.S. Patent No. 5,633,200, which are incorporated herein by reference.

Please amend paragraph number **[0003]** as follows:

[0003] In the manufacturing of an integrated ~~circuits~~ circuit upon a semiconductor substrate, barriers are often needed to prevent the diffusion of one material to an adjacent material. For instance, when aluminum contacts silicon surfaces, spiking can occur, and when aluminum comes into direct contact with tungsten, a highly resistive alloy is formed. Diffusion barriers are structures commonly used to prevent such undesirable reactions.

Please amend paragraph number **[0027]** as follows:

[0027] The next step is to grow a near epitaxial quality crystalline diffusion barrier material nitride structure from the diffusion barrier material film. This is known as "grain growth." The grain growth step is conducted by heating the diffusion barrier material film in a nitrogen environment, typically to a temperature of between about ~~600°C~~ 600° C and ~~700°C,~~ 700° C, and using a rapid thermal nitridization process.

Please amend paragraph number **[0033]** as follows:

[0033] The resulting lightly nitrided refractory metal silicide structure exhibits beneficial qualities for use in structures such as word and bit lines and interconnect access lines, with a reduced tendency to decompose or agglomerate over time due to nitridization which forms in grain boundaries and inhibits grain boundary movement. AFM studies have shown that grain uniformity is highly improved, as is surface smoothness and thermal stability during rapid thermal annealing at 650° C and 850° C after the refractory metal strip. The addition of the nitride of the diffusion barrier material cover layer produces a large grain structure at the surface which is resistant to deposition at high temperatures and exhibits stability up to ~~850°C~~ 850° C in furnace anneals and ~~1000°C~~ 1000° C in rapid thermal anneals.

Please amend paragraph number **[0054]** as follows:

[0054] When the target is substantially covered, the diffusion barrier material deposition rate is slowed. Further, diffusion barrier material nitride nucleation and grain growth occur simultaneously during deposition, and become uncontrollable. This is also known as saturation sputtering. By choosing a nitrogen content operating level close to the optimum nitrogen content operating level, the target will be only partially covered during diffusion barrier material deposition, will not yet be saturated, and a proper nucleation stage with a light, uniform nucleation of nitrogen in the layer of diffusion barrier material will be achieved. No diffusion barrier material nitride grain growth occurs in the diffusion barrier material layer during deposition, and the diffusion barrier material nuclei is prepared for a well controlled grain growth to occur in a separate step. Light nucleation is defined herein as between about ~~$4x10^8$~~ 4×10^8 to about ~~$4x10^{10}$~~ 4×10^{10} nuclei of diffusion barrier material nitride per cm^2 of diffusion barrier material. The nitride nuclei of the diffusion barrier material will preferably have a diameter in a range from about 30 Angstroms to about 50 Angstroms.

Please amend paragraph number **[0055]** as follows:

[0055] The next step in the process is to grow large uniform diffusion barrier material nitride grains from the nucleated nitride of the diffusion barrier material. As a result of the light and uniform diffusion barrier material nucleation resulting from the above-described process, a uniform large grain diffusion barrier material nitride film will result from the growth stage. Grain growth is conducted in a furnace or rapid thermal nitridation chamber such as the Centura HT, available from Applied Materials company of Santa Clara, California. Grain growth is preferably conducted at a temperature of between approximately ~~600°C~~ 600° C and ~~700°C~~ 700° C in a rapid thermal nitridization process, wherein the temperature is ramped up quickly to a high ~~temperature,~~ temperature; the high temperature is sustained for a short period of time, and is then ramped back down again. Other nitridation and grain growth procedures and parameters may also be suitable. The grain growth is conducted in an environment containing a heavy content of nitrogen molecules or atomic species which may comprise, for example, N_2 or could comprise an atomic plasma of nitrogen. The annealing temperature can be substantially lower than ~~600°C,~~ 600° C, down to ~~400°C,~~ 400° C, for example, if a high quality atomic nitrogen environment can be maintained.

Please amend paragraph number **[0056]** as follows:

[0056] The result, depicted in Figure 4, is the formation of a near epitaxial quality diffusion barrier material nitride film 26 which is suitable for use as a diffusion barrier and substrate 24 which may, as noted previously, be other than a silicone substrate. The film will preferably have a substantially crystalline structure and will have a smooth surface to the extent of having a peak-to-valley roughness of less than about ten percent of the thickness thereof. The film also has uniform and large grains, a non-columnar structure, and incurs low stress on adjacent layers. The grains of the nitride of the diffusion barrier material will preferably be grown in the layer of the diffusion barrier material so as to have a diameter in a range from about 1000 Angstroms to about 2000 Angstroms.

Please amend paragraph number **[0057]** as follows:

[0057] The diffusion barrier material nitride film of the present invention is highly suitable for forming an improved diffusion barrier of the type shown in Figure 1. It has also been found to be beneficial and suitable for forming a thermally stable, low resistance, large grain cover layer for the refractory metal silicide stack structure discussed above. The thermal stability achieved is such that substantially no out diffusion of nitrogen from the layer of the nitride of the diffusion barrier material will result when heating in an environment comprising a gaseous nitrogen content within either of a furnace at a temperature up to ~~850°C~~ 850° C for a time of up to 30 minutes, or a rapid thermal nitridization process at a temperature up to 1000°C for a time of up to 20 seconds.

Please amend paragraph number **[0058]** as follows:

[0058] In forming the refractory metal silicide stack structure with a diffusion barrier material nitride cover layer, the steps illustrated in Figures 5 through 10 are conducted. First, as shown in Figure 5, an oxide barrier layer, such as a gate oxide layer 46 is formed on a silicon substrate 28. A surface layer such as a polysilicon film 30 is then formed on gate oxide layer 46. Next, a light nitridation of nitrogen atoms 32 is implanted into ~~surface layer~~ polysilicon film 30. The implantation of nitrogen atoms 32 is represented by arrows and is conducted using a physical vapor deposition chamber such as a Varian SHC-80 Ion Implanter. The implanter is set at a power of about 10 KeV to implement a concentration of about 10^{13} atoms of nitrogen per square centimeter. Phosphorous may be substituted for the nitrogen. When implanting phosphorous, the phosphorous is implanted in substantially the same quantities and with substantially the same stop range as nitrogen.

Please amend paragraph number **[0060]** as follows:

[0060] In a further step, the refractory metal is transformed to refractory metal silicide with a rapid thermal anneal conducted at a temperature of ~~650°C.~~ 650° C. The unreacted refractory metal is then stripped from the surface, and a second anneal is conducted at a temperature of about ~~850°C~~ 850° C to rearrange the internal structure of the refractory metal silicide to a more thermally stable phase species. This results in the structure of Figure 7, showing therein a resulting ~~film~~ stack of lightly nitrided refractory metal silicide layer 50, for example $TiSi_2$. The light nitridation in the form of nitrogen atoms 36 remains in the film and at the refractory metal silicide and polysilicon interface.

Please amend paragraph number **[0063]** as follows:

[0063] Next, diffusion barrier material nitride grains are grown. The grain growth, as discussed above, is preferably conducted with a rapid thermal nitridation process at a temperature of between about ~~600°C~~ 600° C and ~~700°C.~~ 700° C. The annealing temperature can be substantially lower than ~~600°C,~~ 600° C, and may be as low as ~~400°C,~~ 400° C, if a high quality atomic nitrogen environment can be maintained.

Please amend paragraph number **[0064]** as follows:

[0064] A diffusion barrier material nitride cover layer 42 located over a refractory metal silicide ~~stack structure~~ layer 50, as shown in Figure 9, results. The diffusion barrier material nitride and refractory metal silicide stack structure is highly suitable for applications such as the formation of local interconnects and word lines. Such a structure is shown in Figure 10, where a gate region is shown formed with gate oxide layer 46, a polysilicon gate 48, and a refractory metal silicide layer 50 overlying polysilicon gate 48. Diffusion barrier material cover layer 52 is upon refractory metal silicide layer 50.

Please amend paragraph number **[0065]** as follows:

[0065] The use of diffusion barrier material nitride as a cover layer over refractory metal silicide is highly advantageous. Refractory metal silicide layer 50 forms an excellent diffusion barrier during nucleation of diffusion barrier material nitride and subsequent grain growth, while diffusion barrier material ~~nitride~~ cover layer 52 contributes to low resistivity and provides a thermally stable large grain surface with reduced agglomeration and decomposition. The use of diffusion barrier material nitride as a cover layer also makes it unnecessary to completely transform phases of a refractory metal silicide, such as C-49 phase $TiSi_2$ to C-54 phase $TiSi_2$. This is advantageous in certain applications, as doing so is difficult if refractory metal silicide layer 50 is thin. A 100 nm diffusion barrier material nitride layer over a 25-50 nm refractory metal silicide stack has been found to exhibit high temperature stability up to ~~850°C~~ 850° C in furnace annealing and up to ~~1000°C~~ 1000° C in a rapid thermal anneal in N_2.